Storage Backup and Disaster Recovery:

Using New Technology to Develop Best Practices

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Recent advances in data storage and data protection technology are nothing short of phenomenal. Today, even small businesses can afford solutions approaching 100% up time for their information systems. As storage and backup functionalities evolve, the lines between the two are beginning to blur. This paper covers some of the key features of Cybernetics’ miSAN D Series and V Series product line and their implementation for best data protection practices.

**iSCSI SAN Storage**

Until recently, Direct Attached Storage (DAS) and Network Attached Storage (NAS) solutions were what small to mid-sized businesses could afford to add capacity while a Storage Area Network (SAN), usually connected to a Fibre Channel network, was within reach of only the largest enterprises. With the advent of iSCSI technology, and the introduction of miSAN, it’s now simple and affordable for most organizations to add a true, block level SAN to an Ethernet network and to realize huge benefits in performance and resource utilization. The widespread adoption of Virtual Machines is fueling interest in iSCSI SAN, because virtual servers make virtual storage a necessity.

With Cybernetics’ miSAN D Series, terabytes of highly reliable RAID storage capacity can be allocated across a variety of servers, operating systems, and databases. Full-featured yet surprisingly easy to manage, miSAN is live, block level storage that is fast, efficient, reliable – and affordable.

**Snapshot Backup**

The first line of defense in data protection is the snapshot - a time-stamped mount point, providing a mountable version of the volume at a specific point in time. A snapshot can be mounted as a read-only volume, from which files can be recovered, reports can be run and full backups can be created. If someone accidentally deletes an important file, simply mount a prior version of the volume and copy the missing file to the live volume. miSAN D Series snapshots are so powerful that even if a virus were to delete every block of data from a volume, the volume could be restored and brought live by rolling back to the snapshot prior to the virus attack. When planning to take advantage of snapshot backup, allow at least an equal amount of storage capacity for the snapshot area as the volume it is protecting – in other words, double the total storage capacity. Administrators control the frequency of snapshots, so consider the options carefully. Less frequent snapshot intervals allow for older versions to remain online longer. It is important to note that a snapshot requires the hardware resource to be in tact. If the iSCSI RAID is destroyed, the snapshot protection is useless.

**WAN Synchronization and Replication**

A pair of miSAN D Series models can maintain synchronized replication volume pairs, even across a WAN. Even if the original hardware resource is destroyed, data can be fully recovered. This data protection feature capitalizes on snapshot data to replicate deduplicated changed blocks to a remote miSAN iSCSI RAID unit. At the point of snapshot, the most current version of changed blocks are asynchronously replicated from one volume to its replication pair volume, keeping the volumes perfectly synchronized to the last snapshot mount point. In the event of a catastrophe to the original hardware resource, servers can be redirected to the remote volume for instant access to the data. With the miSAN D Series, local users have snapshot protection against corruption and deletions, as well as a live, remote replica to protect against site catastrophe.
High Availability
For mission critical applications, the high availability feature of the miSAN D Series is an automated alternative to replication. With a high availability pair, every write is mirrored at the hardware level from the master to the slave. There is a heartbeat between the pair and if there is a failure in the master, it will automatically fail over to the slave unit. The slave unit becomes the master in an instant. Users will never notice an interruption in operations. IT staff can resolve the problem and fail back to the original master in background. High availability demands high bandwidth between the master and slave, and is thus designed for a LAN environment. With Cybernetics miSAN D Series units, both local high availability and off-site WAN synchronization and replication features can be simultaneously deployed for full ranging disaster protection.

Image Tape Backup
The miSAN D Series is equipped with a tape backup feature designed to archive volumes for long term storage as well as disaster recovery. Any volume can be archived to a SCSI attached tape drive using the on-board tape backup feature. The miSAN iSCSI SAN storage volume can even be used as a bootable system volume through an IP storage adapter. In this configuration, all data is stored on the miSAN, and the full image tape backup becomes a bare metal recovery solution. To satisfy legal requirements for access to historical data, or just for emergency recovery copies of snapshots no longer stored on disk, there is no better media for long-term preservation of data than tape.

USB Disk Offload
The miSAN D Series has a front panel USB port for quick and easy offload from RAID volume to portable volume. The miSAN D Series engine, SANDR includes a menu option for offloading a virtual disk volume to a standard USB disk drive. The USB disk drive is fully functional as a live disk and can be mounted as a volume on another server.
iSCSI SAN Backup

Full Backup
Anyone who has ever experienced a recovery emergency first hand is a true believer in the importance of frequent full backups. While intermediary strategies like snapshots and replication are tremendous for day-to-day business continuity and uptime, full backup is an absolute necessity for true security against data loss. Tape is still the best medium for long term archives – it is very rugged and has an incredible shelf life. Perhaps tape’s best attribute is the fact that the media is not dependent on any given tape drive. A drive with read/write heads may be very fragile, but the tape is not sensitive, and can easily be transported to another drive or another location for data recovery.

While data deduplication may be the current buzz in backup, one should really think about the application of this technology. Deduplicating data for transport over slower WAN connections for purposes of data replication and synchronization makes perfect sense. The data volume is reduced making WAN speeds feasible, and the disk volumes are synchronized so there is a full copy of the data. Deduplication for the sake of reducing the size of backup is altogether different. If backup is defined as redundant copies of data, deduplication, or elimination of all redundancy is the antithesis of backup. Deduplication solutions build a complex database of pointers for all references to the same data sequence. Some of these solutions even rely on a hashing algorithm to determine whether the data sequences are in fact identical. There is a statistically significant chance that the hash will return an incorrect result, primarily because the data tested is not purely random in nature. Why risk the integrity of full backup when the cost of disk storage is only about $1 per GB, and the cost of tape storage is only about 10 cents per GB? In a recovery, access to more than one backup copy can mean the difference between success and failure.

Today, Cybernetics has the most advanced full backup solution on the market, using the power of virtualization to capitalize on the exceptional benefits of both disk and tape – the miSAN V Series iSCSI SAN backup solution.

Virtual Tape
Few realize that a backup to virtual tape on disk is much faster than a disk-to-disk file system copy backup. Tape has been the primary backup medium from the beginning and data is laid to tape in a highly efficient format. A disk copy has file system overhead resulting in poor backup performance. On any given file, a backup to virtual tape will far exceed the performance of a disk copy of the same file. The same performance benefits apply to restores. In an instant, a virtual tape is loaded, the file is located and the restore begins at RAID 5, virtual tape speed.
Virtualization has an even more significant performance benefit. Several virtual tape drives can all run completely independent backup jobs simultaneously. With just one or two physical tape drives, servers are backed up in sequence, each waiting for the previous backup job to complete. With up to ten virtual tape drives running simultaneous backup jobs in a miSAN V Series model, the window required for backup is reduced dramatically. The miSAN can achieve speeds in excess of 300MB/s while streaming concurrent backup jobs. Backup to removable tape can be slowed by backup software overhead - many software packages have a maximum speed of 60MB/second per backup job. Linear tape drives often take a significant performance hit due to inconstant data streams resulting in repositioning, or “shoe-shining”. Customers using LTO-4, a tape technology with the ability to handle 120MB/second uncompressed, commonly achieve half of their potential. Since the miSAN virtual tape library offloads virtual tapes to physical tapes via a dedicated U320 SCSI bus, off-line and without backup software or other overhead, an LTO-4 tape can be written or read at its peak performance of 120MB/second, or better with compression.

**Compression**
Cybernetics was the first company to introduce hardware data compression to tape backup, and today the miSAN VTL is available with optional data compression. For compressible text and database files, compression delivers exceptional capacity and performance benefits – usually double speed and double capacity.

**Removable Tape**
miSAN V Series performs completely serverless archival of selected virtual tapes to removable tape. Users can create a removable tape on demand, or can schedule creation upon completion of the virtual tape backup job. There is no third party backup software used and there is absolutely no host server involvement. The archive to tape streams block of data directly to the tape drive at the maximum rate the tape drive can sustain. The resulting tape is 100% universally compatible and can be recovered any time, anywhere.

**Encryption**
Responsibility for data does not end when the backup tapes are sent off-site for safe-keeping. Consumers, corporate executives and their attorneys, and auditors are recognizing the vulnerability of confidential data when it is stored on portable media. Cybernetics miSAN V Series is available with a complete encryption / key management suite for protecting data at any level. Virtual tapes and/or removable tapes can be encrypted to make absolutely certain that there can be no unauthorized access.
Best Practices
Developing a plan requires an analysis of systems and resources. Diagram the network or enterprise and rank the business significance of all systems and data volumes. Define your Recovery Point Objective (RPO) and your Recovery Time Objective (RTO). Consider legal requirements for the handling and storage of the data. A crucial web shopping cart server may have zero tolerance for any interruption in service and for any lost data. High availability may be a necessity there. A financial systems server may require archives for a period of years – best suited to WORM tape backup. Then use the rating schedule below to determine which of the miSAN data protection components should be applied to various information stores.

Founded in 1978 and headquartered in Yorktown, Virginia, Cybernetics is a privately held corporation specializing in the design and manufacture of high performance disk, tape, and virtual tape storage solutions. The product line is built on leading edge technologies which have been rigorously tested to deliver seamless compatibility and reliability. Known for developing innovative – and exclusive – features, Cybernetics solutions typically provide greater functionality, data accessibility, and return on investment than competitive solutions. The company’s dedication to high quality products, backed by the best in support in the industry, has made it the widely recognized leader in the data storage industry. For more information contact: (757) 833-9000.